The Petroleum Situation

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WORLD OIL STOCK POSITION

Oil stocks have been very much in the news this year. Three examples of this are the building of stock levels worldwide until a surplus developed by July, pressure on the administration from Congress to start adding oil to the strategic petroleum reserve, and, more recently, an expression of relief that stocks were sufficiently high to alleviate problems following the Iraq/Iran conflict. But there are also a wide range of statements made as to the actual level of stocks that are available. Since interest in the volume of oil in storage is unlikely to decrease for the next few years, the distribution of oil stocks along the supply chain and how much oil is available to help cushion supply interruptions may help in understanding the oil supply situation in the future.

Working our way from production through to consumption, considerable oil stocks are held at virtually all stages of this process. To try to identify specific volumes, we will consider the following:

- Stocks at producing fields,
- Stocks at loading ports,
- Crude oil and oil products at sea,
- Stocks at discharge terminals,
- Stocks at refineries,
- Crude oil and oil products in land transit (including inland waterways), and
- Stocks of oil held by consumers.

Producing wells vary greatly in size, from a few barrels a day for stripper wells to several thousand barrels a day for some of the Middle East giants. Crude from the wellhead is most commonly transmitted by pipeline, though trucks are used for the smaller wells. In all cases, there will be some form of storage at or close to the production site capable of holding from a couple of days to several weeks' oil production. An average figure of 300 million barrels would represent normal circumstances, with a limited ability to go to 600 million, if necessary.

Where crude oil is moved by sea, significant stocks have to be held at the loading port to allow for the many problems that can occur during the process. The storage capability again will vary, but a range of 5 to 20 times the average daily movement covers most situations. Roughly 500 million barrels is the volume held under typical circumstances with an ability to raise this to about 800 million under "pressure" from market or other circumstance.

Movements of oil and oil products by sea, including U.S. domestic traffic, are currently about 37.5 million barrels daily, with each barrel moving an average of around 4,000 miles. This indicates a volume of approximately 600 million barrels of oil in ocean-going vessels at any one time. In addition to this volume in vessels, some of the oil (crude and product) will be discharged into terminals other than refinery terminals. This volume is not easy to estimate, since we are trying to distinguish between oil held in a terminal as an integral requirement of refinery supply (such as the Panama Canal Terminal), and oil held for other reasons. Here we assume an approximate figure of 100 million barrels.

This then brings us to oil stocks at refineries. These also vary depending on the supply source. A refinery in the U.S. basically running on domestic oil will tend to hold lower stocks than one relying on 100% Middle East oil, if only because the prospect of supply interruption is greater in the second case. Oil stocks at refineries, including crude oil, oil being processed, and stocks of product waiting to be shipped out, run at around the equivalent of 40 days of product throughput. This is a "basic" figure and does not allow for any seasonal storage. It puts the volume of oil stocks at refineries at 2,100 million barrels for the non-Communist world.

Oil and oil product in transit include oil in pipelines, road and rail tank cars, product at terminals and product

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held by retailers. This figure is going to vary around the world, being proportionally higher where overall throughput is low. An approximate average, however, is equivalent to 10 days consumption, or about 500 million barrels.

The final area of significance is stocks at the consumer level. This ranges from the large stocks held by electric power plants, for example, to the gasoline held in individual auto tanks. An estimated figure for the total volume worldwide is about 250 million barrels when circumstances are normal, but this figure can certainly double, or go higher, if supply problems are anticipated.

Normal inventory levels by category are summarized below.

NORMAL INVENTORY LEVELS BY CATEGORY
(Million Barrels)

	U.S.A.	Rest of World (excluding CPE's)	Total
Production Centers	60	240	300
Crude Loading Ports*	40	460	500
Volume at Sea	25	575	600
Terminals*	35	65	100
Refineries*	700	1,400	2,100
Inland Distribution	180	320	500
Consumer Stocks	100	150	250
	1,140	3,210	4,350

* These items cover storage normally included in official statistics (Primary Distribution). Some of the quantity shown for inland distribution is also included in such statistics.

There are two other factors that have to be considered before any conclusion as to the existence of an inventory surplus can be drawn. The first of these is the volume of product going into storage to allow for seasonal variations in product demand. Gasoline demand is usually higher in the summer than in winter and, as a general rule, gasoline stocks rise in winter and fall in summer. The reverse is true for home heating oil. The trend is that the northern hemisphere's summer demand for oil products (May through September) is 12 to 12.5% lower than winter. As a result, stocks climb in summer, reaching a peak at the end of the third quarter and fall in winter, being lowest at the end of the first quarter. The variation from September to April usually lies between 300 and 400 million barrels. This represents an addition to the normal base load figure covered in the table above.

The second factor, which has developed over the last seven years, represents oil stored deliberately by national governments directly or at the instigation of those governments for strategic reasons. Current U.S. strategic stocks are close to 100 million barrels. Japanese strategic stocks are also around this level though only 33 million barrels are owned by the government, and other OECD states are estimated to add a further 100 million, reaching some 300 million in total. When looking at "official" statistics, it must be remembered that these "strategic" stocks are usually incorporated with the total. The U.S. is an exception, with S.P.R. stocks being quoted separately from total stock figures.

Based on this breakdown, oil stocks at the end of September will include the following volumes that represent a "normal" or base line position. Any oil surplus to this total can be considered as an "inventory surplus" that is available to cover a supply disruption.

	Million Barrels
Producer Stocks	300
Loading Port	500
At Sea	600
Terminals	100
Refineries	2,100
Inland Distribution	500
Consumer Stocks	250
Seasonal Stocks	400
Strategic Reserve	300
	5,050

When considering these figures and comparing them with published official stocks — the weekly stock estimates published by the American Petroleum Institute, for example — it must be remembered that for most states these figures will include stocks at bulk terminals, including oil for loading or unloading, and stocks at refineries and pipelines. Oil at sea, oil in transit and oil held by consumers are *not* included in these figures.

We have made estimates of current stock levels by type which are shown below. The following comments provide some background on these estimates.

ESTIMATED CURRENT (END SEPTEMBER '80) STOCK POSITION
Million Barrels)

	U.S.			Rest of World (excluding CPE's)			Total
	Basic[1]	Seasonal	Surplus	Basic[2]	Seasonal	Surplus	
Producer	60	–	10	240	–	30	340
Loading Ports	40	–	20	460	–	30	550
Volume at Sea	25	–	5	615	–	60	705
Terminals[1]	125	40	70	135	40	80	490
Refineries	700	70	155	1,500	120	110	2,655
Inland Distribution	180	30	10	320	50	30	620
Consumer Stocks	100	20	–	150	30	–	300
	1,230	160	270	3,420	240	340	5,660

[1] including U.S. Strategic Petroleum Reserve at 91 million BBL.
[2] includes 210 million "Strategic Reserve" – 70 million at terminals, 40 million at sea and balance at refineries.

The "surplus" assumed at producing centers and at loading ports for the rest of the world is virtually all OPEC surplus. This indicates stock buildup by North African and South American producers that developed in the recent "mini-glut" period and some stocks that have accumulated at Middle East ports recently.

The volumes at sea include a significant buildup due to a general application of slow steaming offset by the reduction following the closing of the Shatt-al-Arab. Some product deliberately held in tankers anchored as floating storage is also included.

The volumes held by terminals, refineries, and some of the inland distribution volume represent the major portion of reported stocks. U.S. reported stock position at the end of August was 1,327 million barrels, and, by the end of September, this is estimated to have reached 1,340 million. With 235 million at terminals, 925 million at refineries, and 60 million at "loading ports" essentially associated with the movement of North Slope crude, this leaves an estimated 120 million barrels of "inland distribution" stocks being included in the reported stocks. The low level of assumed surplus in the inland distribution and consumer sectors for the U.S. is a function of the recession, high interest rates, and general free availability of product. It is estimated that U.S. distributors and consumers had stock surplus of over 100 million barrels towards the end of 1979, and this buildup masked a greater downturn in consumption. By contrast, drawdown of these stocks has exaggerated the downturn this year.

For the rest of the world, a large portion of the terminal and refinery stocks is held by states reporting to the IEA, and, excluding the U.S., these are at about 1,850 million barrels. Assuming about 80 million of this is covered by stocks in vessels at anchor and stocks at loading ports, with another 180 million covered by "inland transportation," this leaves about 400 million barrels being stored by non-OECD states in their "primary distribution systems." The same argument applies to the rest of the world as applies to the U.S. with regard to consumer stocks. With the recent free availability of product, such levels are not high.

Based on this analysis, there is a cushion of about 600 million barrels of oil or oil product currently in stock. Of this cushion, some 550 million is in the hands of non-OPEC consumers and producers. This represents 12% of current "basic" stocks and less than 12 days at current consumption rates. If it is assumed that the current Iran/Iraq conflict removes 4 million barrels per day from this "cushion," then continuation of the conflict would exhaust the cushion before the end of winter. It is clear that anticipation of this exhaustion plus general concern for future supply would lead to attempts to retain stock positions and, hence, to a much earlier price run-up. The current stock level is high and thus provides a cushion against supply disruption. The effect of these stocks is, however, limited.

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UNITED STATES PETROLEUM HIGHLIGHTS

SUPPLY

If the production of North Slope crude is excluded, the balance of domestic crude oil production declined at an annual rate of 3.33% between 1973 and 1979. If each month of 1980 is compared with the comparable month of 1979, the average decline is just under 2%. This is not a spectacular change, but the trend for recent months (the average for the last 3 months being a 1.1% decline) does indicate a slowdown in the decline of U.S. oil production. This is to be expected with the price increases and record drilling levels, but it is encouraging to see the theory proving out in practice. It is probable that the numbers will be even more encouraging by early 1981.

Another interesting factor in the supply statistics is the "Other Supply" figure. So far this year, volume is up significantly over 1979. A major element in this number is processing gain, essentially representing the production of lighter products from heavy oil in refineries, with the associated increase in volume (weight does not change, but lighter products occupy more volume). The processing gain is primarily a function of cracker throughput, and the rise in this figure indicates that despite a lower overall volume of crude throughput by refineries, cracking throughput seems to be up.

DEMAND

The decline in demand, induced by price jumps and the recession, continues. The decline in distillate fuel demand, which in August is only mildly affected by weather conditions, seems to reflect a much lower consumption by industry.

STOCKS

Total U.S. stocks are now 173 million barrels higher than in January, 1979. This means that close to 290 thousand barrels has gone into storage every day for the last 20 months. The figure for 1980 alone is over 330 thousand barrels per day.

PRICES

Despite a small climb in the average price of imported crude and a substantial jump in domestic crude, the change in mix led to a fall in refiner acquisition cost of crude in August. The volume of imported crude declined significantly and the share fell from 43.1% in July to 38.9% in August.

The monthly increase in domestic crude prices is currently greater than for imported crude but it must be remembered that the big OPEC price run-up in 1979 widened the gap between domestic and foreign crude. As a result, the jump in foreign crude price was even greater than that of domestic, *despite* the rise in average domestic crude from $14.74 in July, 1979 to $25.05 in 1980. Consequently, average refiner acquisition cost of crude was $5.62 per barrel lower than imported crude in July, 1980 versus $4.38 for July, 1979. This difference is a good measure of the difference between oil costs in the U.S. and overseas. It is a difference which will vanish by October, 1981 due to decontrol.

Prices for products, with the exception of residual fuel, were either static or fell in July. The jump in residual

TABLE 1

REFINER ACQUISITION COST OF CRUDE OIL

CLASS	Price $/BBL JULY 1980	Percent Share of Total Crude JULY 1980	Price $/BBL JULY 1979	Percent Share of Total Crude JULY 1979
Lower Tier	7.11	8.8	6.44	14.3
Upper Tier	15.12	13.3	13.76	19.9
Alaska	26.47	10.0	18.97	8.2
Stripper	34.45	13.9	23.80	10.2
NPR	33.44	0.8	20.13	0.7
Newly Discovered	38.35	3.3	25.87	0.6
Heavy Oil/Decontrolled	33.64	10.6	–	–
Tertiary	30.27	0.4	17.16	–
Domestic Composite	25.05	61.1	14.74	53.9
Imported	34.51	38.9	23.07	46.1
Composite	**28.73**	**100.0**	**18.58**	**100.0**
"Entitlements" Penalty	0.16	–	0.11	–
Refiner Acquisition Cost	28.89	–	18.69	–

Sources: U.S. Department of Energy
Chase Manhattan Bank

fuel price, however, significantly helped the Type 2 refinery margin. Despite this help, the negative margin for these refiners is such that, if continued, the existence of many of them may be in jeopardy.

TABLE 2

AVERAGE WHOLESALE PRICES FOR PETROLEUM PRODUCTS

(Cents/Gallon)

	1980 AUG.	1980 JULY	1980 JUNE	1979 AUG.
Motor Gasoline	90.4	91.3	90.7	61.7
Kerosine	80.6	80.8	80.6	63.6
Distillate Fuel	78.6	78.6	78.3	61.7
Residual Fuel	44.1	40.9	37.9	36.6

Source: Independent Petroleum Association of America

TABLE 3

SPREAD BETWEEN GROSS REVENUE AND CRUDE OIL COST

($/Barrel)

	Type 1 Refinery	Type 2 Refinery
1975	1.21	0.10
1976	2.01	0.31
1977	2.49	0.94
1978	2.39	0.10
1979	4.19	0.84
April 1980	4.66	–2.18
May 1980	4.20	–3.05
June 1980	3.72	–3.73
July 1980	4.17	–2.92

Note: Spread figures are calculated as follows:

	Motor Gasoline	Kerosine	Distillate Fuel	Residual Fuel
Type 1	50%	8%	25%	17%
Type 2	21%	8%	19%	52%

	AUGUST 1980 Thous. Bbls. Daily	AUGUST 1979 Thous. Bbls. Daily	AUGUST Change – % –	3 MOS. AVERAGE 1980 Thous. Bbls. Daily	3 MOS. AVERAGE 1979 Thous. Bbls. Daily	3 MOS. AVERAGE Change – % –	YEAR TO DATE AVERAGE 1980 Thous. Bbls. Daily	YEAR TO DATE AVERAGE 1979 Thous. Bbls. Daily	YEAR TO DATE AVERAGE Change – % –
PRIMARY DEMAND									
Motor Gasoline	6,764	7,332	– 7.7	6,705	7,122	– 5.9	6,617	7,126	– 7.1
(Unleaded)*	3,203	2,970	7.8	3,127	2,849	9.7	3,013	2,768	8.8
Jet Fuel	1,073	1,088	– 1.4	1,043	1,089	– 4.2	1,063	1,070	– 0.6
Kerosine	103	160	– 35.6	113	145	– 22.0	157	194	– 19.0
Distillate Fuel	2,342	2,772	– 15.5	2,364	2,677	– 11.7	2,862	3,360	– 14.8
Residual Fuel	2,204	2,479	– 11.1	2,316	2,493	– 7.1	2,540	2,852	– 10.9
All Other	3,823	4,368	– 12.5	3,670	4,127	– 11.1	3,863	4,008	– 3.6
Total Domestic Demand	16,309	18,199	– 10.4	16,211	17,653	– 8.2	17,102	18,610	– 8.1
Exports	565	452	25.0	527	470	12.1	519	479	8.3
Total Demand	16,874	18,651	– 9.5	16,737	18,123	– 7.6	17,621	19,089	– 7.7
New Supply									
Domestic	11,139	10,841	2.7	10,914	10,821	0.9	10,848	10,632	2.0
Crude Oil	8,654	8,699	– 0.5	8,685	8,489	2.3	8,687	8,516	2.0
Natural Gas Liquids	1,560	1,614	– 3.3	1,578	1,633	– 3.3	1,604	1,679	– 4.4
Other Supply	925	528	75.2	651	699	– 6.9	557	438	27.2
Imports	6,043	8,552	– 29.3	6,179	8,354	– 26.0	6,940	8,349	– 16.9
Crude Oil	4,606	6,774	– 32.0	4,820	6,559	– 26.5	5,376	6,404	– 16.1
Refined Products	1,437	1,778	– 19.2	1,359	1,795	– 24.3	1,564	1,945	– 19.6
Residual Fuel	905	1,023	– 11.5	875	991	– 11.6	928	1,183	– 21.6
All Other	532	755	– 29.5	484	805	– 39.9	637	761	– 16.4
Total New Supply	17,182	19,393	– 11.4	17,093	19,175	– 10.9	17,788	18,981	– 6.3
Crude Oil Refined	12,772	14,827	– 13.9	13,252	14,822	– 10.6	13,538	14,494	– 6.6
Stock Change	308	742	–	355	1,052	–	167	–108	–
Stocks – End of Month in Million Barrels									
Gasoline	259	233	11.4						
Jet Fuel	40	34	15.6						
Kerosine	15	14	5.4						
Distillate Fuel	224	195	14.5						
Residual Fuel	86	88	– 2.0						
All Other	314	304	3.1						
Total Products	937	868	7.9						
Crude Oil	391	321	21.8						
Total – All Oils	1,327	1,189	11.6						

Totals may not add due to rounding
*Included in motor gasoline

Sources: *American Petroleum Institute*
Chase Manhattan Bank
Department of Energy